LAD WORK (pg 1 of 1) What Makes a Good Graph?

Name____________________

1. Graph Paper (On excel, always use both horizontal and vertical gridlines)

You should always make your graphs on graph paper or with a graphing program (spreadsheet such as numbers, excel, or open office). Do not use composition lined paper, do not use plain paper and ruler in your own grid. If you do you graph on the computer, be sure that you have put in enough grid lines to make it easy to read the value of data points. You can control the gridlines in most graphing programs.

2. As a minimum always give your graph a 2 (or 3) part title in the following form:
LAD #, (y-axis) vs (x-axis), and perhaps a third part, a descriptive title.

As a result of the discussion above, the title of your graph might be "Speed of Reactions: Reaction Rate vs Temperature"

3. Always label the x and y axes in 3 ways: description, numerical values, and units. The y-axis should be a rotated title, not a vertical title.

Of course you must put numbers along the axes, but not every number must be filled in just the major values or the first few to indicate the scale. Students sometimes forget to put a label on the axis that describes what those numbers are, and even more frequently forget to say what the measurement units are. For example, if you're going to do a graph which uses temperature as the independent variable, you should write the word "temperature (degrees Celsius)" on that axis so your reader knows what those numbers stand for. Otherwise, no one will know that you're talking about temperature, and even if they do, they might think you're talking about degrees Fahrenheit. The increment size need not be the same on the two axes (though it must be the same throughout for a single axes – you should not change the value of the boxes half way through).

4. Always make a line graph

Never, ever make a bar graph when doing chemistry stuff. Bar graphs are good for subjects where you're trying to break down a topic (such as gross national product) into its parts. When you're doing graphs in chemistry, scatter graphs are far more useful, because they tell you how one variable changes under the influence of some other variable.

5. Never, EVER, connect the dots on your graph! Make a smooth line or curve, a trendline.

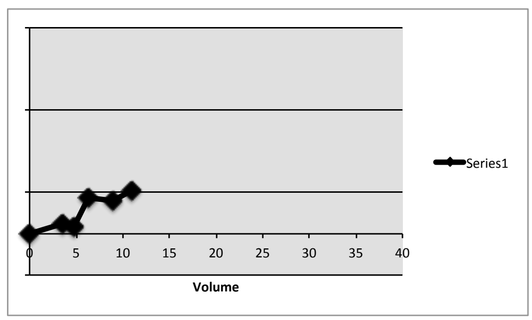
If you're working with your little sister on one of those placemats at Denny's, you can connect the dots. When you're working in chemistry, you never, ever connect the dots on a graph.

Why not connect the dots? When you do an experiment, you always have uncertainty and therefore error. Hopefully not a large error, and it is frequently not something you have a lot of control over. However, when you do an experiment, many little things may go wrong, and these little things add up. As a result, experimental data never makes a nice straight line. Instead, it makes a bunch of dots which kind of wiggle around a graph. However, you can't just pretend that your data is perfect, because it's not. Whenever you have the dots moving around a lot, we could say that the data is noisy, because the thing you're looking for has a little bit of interference caused by normal experimental error. If there is too much noise, the data would be considered to have poor precision.

Your best bet is to show that you KNOW your data is sometimes lousy. You do this by making a line (or curve) which seems to follow the data as closely as possible, without actually connecting the dots. Doing this shows the trend that the data suggests. As long as your line (or curve) does a pretty good job of following the data, you should be OK. Sometimes one (or two) data points may fall far from the rest − learn when to ignore those outliers when drawing the average line.

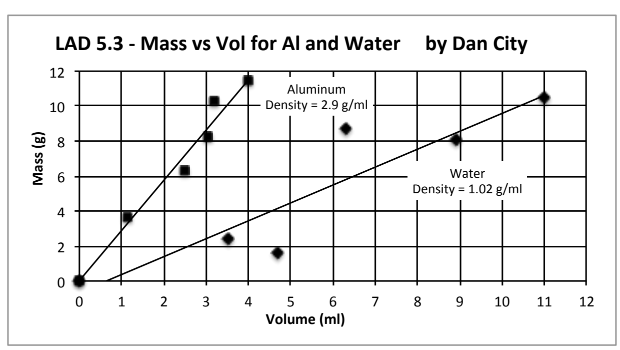
6. Make sure your data is graphed as large as possible in the space you've been given (usually a half or whole page).
If you make large graphs, you'll find it's easier to see when working with the graph.

A bad graph What's wrong with this graph?



7. There's no title. No LAD #, no name. What's it a graph of? Who knows?
8. There are no vertical gridlines, and the horizontal gridlines are too widely separated to be useful.
9. There are no numerical increments on the y-axis.
10. There are no numerical increments, no label and no units on the y-axis. Are the ticks, 1's, 2's or 10's, Is it mass, distance, temperature? grams, miles, or ºC? Who knows?
11. There are no units on the x-axis. Is that volume measured in liters or milliliters? Who knows?
12. The scale could be changed on the axes to make the data spread out and use more of the graph space.
13. What good is the legend? Is has no information. Better to get rid of the legend and label directly beside the line.
14. The "dots" are too large, and "connecting the dots" is not appropriate. This should be a straight trend line, which makes the "average" line, going through as points and having some equally above as below.
15. While the origin of a graph need not always be (0, 0), it probably makes sense in this graph.
16. Why have fill in the graph area? It is ecologically irresponsible to use more ink than necessary, and the fill does not add any value to this graph.

A good graph What's good about this graph?



1. It has a complete title.
2. There are reasonable spaced gridlines, both vertical and horizontal.
3. Both axes are completely labeled with numbers, label, and units.
4. The scale is appropriate, making the data "fill" the graph.
5. The legend has been eliminated, and the equation for the line has been manipulated to include the label for the material. Be sure and note that density units have also been included. Notice that white fill has been put in the text box so that the background gridlines don't make it hard to read the information.
6. The points on the graph are an appropriate size.
7. The trend line (or average line) complete with slope has been included.
8. The scale has been set to make the origin be (0, 0).
9. No extra ink wasted on fill.